Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

9622
2St2

STATION PAPER NO. 66
JULY 1958

SILVICAL Characteristics OF BLACK MAPLE

(*Acer nigrum*)

by
Paul E. Slabaugh

LIBRARY
CURRENT SERIAL RECORD
OC 31 '58
U. S. DEPT. OF AGRICULTURE

LAKE STATES FOREST EXPERIMENT STATION
M. B. Dickerman, Director
FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE

THE SILVICAL REPORTS

During 1907 and the following several years the U. S. Forest Service issued a series of silvical leaflets which covered the broad characteristics of a considerable number of major timber species. Since then much new knowledge has accumulated--some of it published in a variety of sources. There is also a considerable store of unpublished silvical information in the files of the forest experiment stations, the forest schools, and some other agencies. To compile this information systematically and make it available to foresters generally, the Lake States Forest Experiment Station is preparing reports on 15 individual species. Similar reports are being prepared by the other Federal forest experiment stations. When completed, these individual species reports will provide the basis for a comprehensive manual of silvics for the important trees of the United States, to be published by the U. S. Forest Service.

This report is one of the series being prepared by the Lake States Station. A preliminary draft was reviewed by several members of our own Station staff and by a number of well qualified staff members of other forest experiment stations, colleges, and universities; Federal, State, and Provincial forestry organizations; and forest industry. Their comments helped the author to make this report more complete, more accurate, and more up to date.

Every effort has been made to ensure the accuracy and completeness of the information concerning the silvical characteristics of each species consistent with a brief treatment of the subject. We shall appreciate it, however, if any errors or omissions of important information are brought to our attention.

M. B. Dickerman

M. B. Dickerman, Director

Cover: A typical open-grown black maple in southern Michigan. (Photo courtesy of Norman Smith, Michigan Conservation Department). Drawing represents leaves and fruit.

CONTENTS

	Page
DISTRIBUTION	1
HABITAT CONDITIONS	3
Climatic factors	3
Edaphic factors	3
Physiographic factors	4
Biotic factors	5
LIFE HISTORY	5
Seeding habits	5
Flowering and fruiting	5
Seedling development	6
Sapling stage to maturity	6
SPECIAL FEATURES	6
RACES AND HYBRIDS	7
LITERATURE CITED	8

SILVICAL CHARACTERISTICS OF BLACK MAPLE[1/]

(*Acer nigrum* Michx. f.)

by

Paul E. Slabaugh
Lake States Forest Experiment Station[2/]

Although *Acer nigrum*, or black maple, has been recognized as a distinct species for some time, characteristics distinguishing it from sugar maple (*A. saccharum*) are so slight that most foresters have treated it as a variety of that species. Common names include: black sugar maple, hard maple (lumber), rock maple, and sugar maple (9).[3/]

DISTRIBUTION

The botanical range of black maple extends from southern Quebec to southern Minnesota, then south to Arkansas and east to Virginia and Maryland (fig. 1). While the distribution is coincident with that of sugar maple for the most part, the species is not really abundant except in Illinois and Iowa (6). In central Iowa it exceeds the western limit of sugar maple by 120 miles (8) and is found in northeastern South Dakota where sugar maple is absent (13). The commercial range[4/] is confined largely to Iowa and northern Missouri (fig. 1).

1/ In compiling the silvical material on black maple, it was evident that the species had generally been considered a variety of sugar maple, *A. saccharum*, or of insufficient importance to rate separate mention. This compilation aims only to provide information peculiar to black maple. The reader is referred to the sugar maple report (Station Paper 50) for characteristics on which nothing distinctive has been reported for black maple.

2/ Maintained by the Forest Service, U. S. Department of Agriculture, at St. Paul 1, Minnesota, in cooperation with the University of Minnesota.

3/ Numbers in parentheses refer to references cited at end of report.

4/ Commercial range is defined as that portion of the botanical range within which the species grows to commercial size and is a major or important species in the type.

BLACK MAPLE (Acer nigrum)

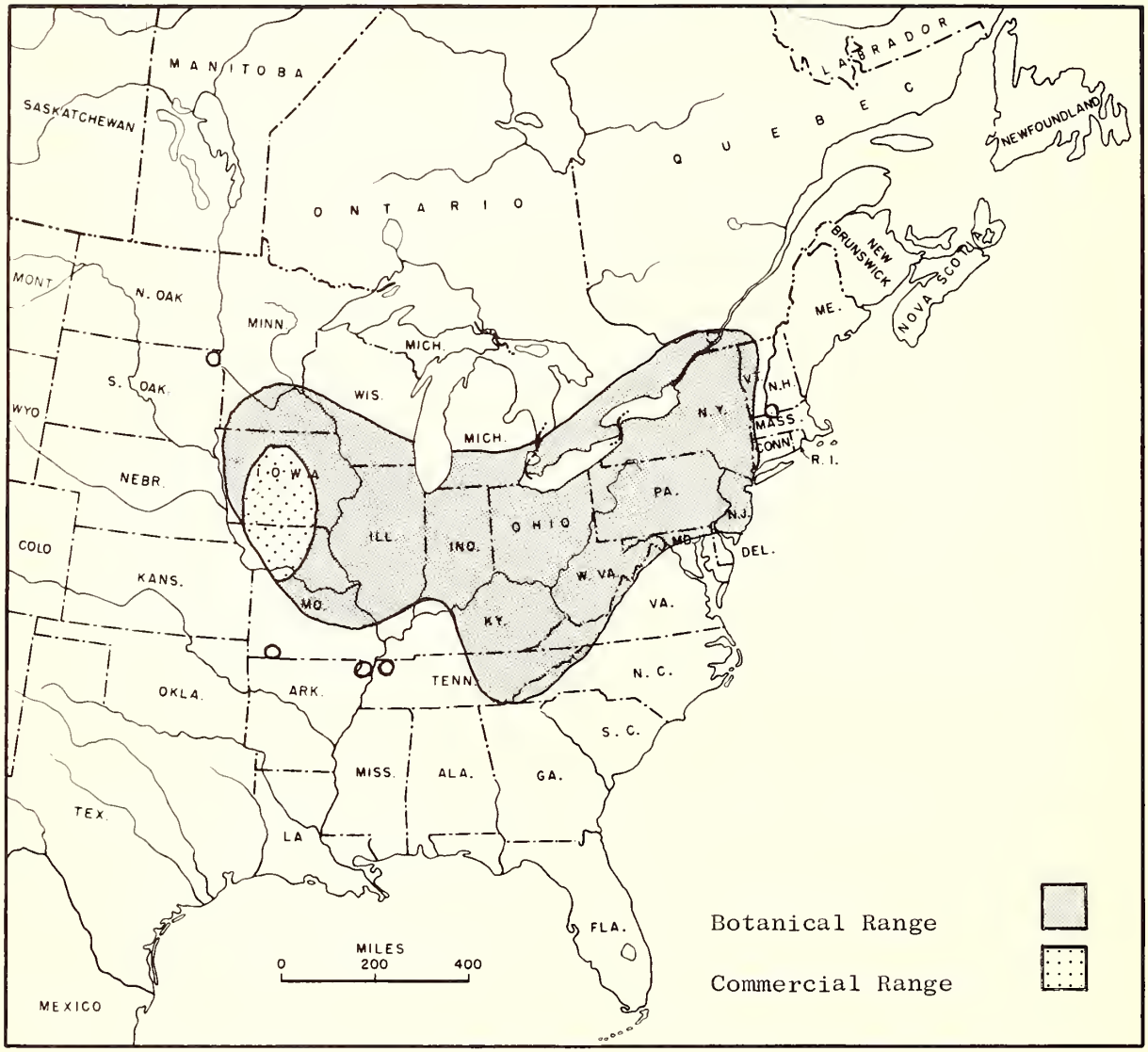

Figure 1.--Botanical and commercial range of black maple.

HABITAT CONDITIONS

Climatic Factors

Climatic factors vary considerably over the range of black maple but the climate could be generalized as moderate in temperature and predominantly humid, with moisture adequate at all seasons (11). Apparently black maple is well adapted to the climate of the prairie regions of Iowa.

More specifically, the average annual precipitation over the botanical range varies from 22 to 50 inches, with about one-half occurring as rain during the growing season. The average snowfall ranges from 10 to 60 inches per year and the total number of days with snow cover averages 10 to 150 (18). There is considerable alternate freezing and thawing of the soil in the southern portions of the area during the winter, due in part to the infrequency of snow cover.

Mean January temperatures vary from 11° F. in the northwest to 37° in the south. Mean July temperatures vary from 71° to 81° at the extremes of the range. The length of the growing season varies from 145 to 200 days (18).

Edaphic Factors

All of the Podzolic and some of the Prairie and Chernozem soil groups occur within the range of black maple; so too do the degraded planosol and alluvial soils (12).

In central Iowa black maple has been found on well-drained uplands with a silt loam topsoil 8 to 10 inches thick, grading into a yellow-brown clay loam subsoil and a calcareous clay till at 30 inches (8). In western Ohio it occurs most abundantly on well-drained to moderately well-drained loams and silt loams (15). Better aeration, associated with the lighter-textured soils, and rolling topography favor the hard maples. Soil types on which black maple is found include Miami and Bellfontaine silt loams and the hilly phase of Miami silty clay loam.

In Iowa, southern Michigan, and southern Ontario, black maple occurs most frequently on moist alluvial soils. In the eastern part of the range, colonies of the tree are restricted to low rich grounds with a limestone substratum (6). Apparently black maple does best on soils with a plentiful supply of lime. This may explain its relatively greater abundance in the western part of its range where the soils contain more available carbonates.

Physiographic Factors

The range of black maple lies primarily in areas which have been subjected to glaciation. Nonglaciated areas where it is found include southeastern Missouri, Kentucky, the Driftless Area of the Upper Mississippi Valley, and, in the southeastern portion of its range, the Appalachian region.

For the main part, the range of black maple is within a region of relatively low relief. In the Lake States it occurs throughout the altitudinal range, roughly from 500 to 2,000 feet. In northern New England and in New York State it is found with sugar maple at elevations up to 2,500 feet, and in a zone from 3,000 to 5,500 feet in the southern Appalachians (3).

Black maple grows well in river bottoms, reaching its greatest concentrations along the streams of the Midwestern States. In central Iowa, where moisture conditions are more critical, it grows in dense, often pure stands along the valleys of the rivers (6) (fig. 2). In Indiana, where black and sugar maples are associated, the black maple usually is found on the moister areas (5). It occurs in coulees in South Dakota (13).

Figure 2.--Black maple stand near the foot of a slope in central Iowa. The four largest trees in the foreground are all black maple. (Photo courtesy Professor A. L. McComb, Iowa State College.)

Biotic Factors

While black maple is not shown as a separate species in the Society of American Foresters' listing of forest cover types (16), it is found with sugar maple in a number of types. Where the botanical ranges of the two hard maples overlap, a few black maples are often found with large numbers of sugar maple; occasionally, however, black maples occur in considerable numbers on small areas. Almost pure stands of sugar maple may occur where black maple is absent.

In central Iowa, black maple is associated commonly with American basswood (*Tilia americana*) (1). Other associates here are red oak (*Quercus rubra*), white oak (*Q. alba*), shagbark hickory (*Carya ovata*), eastern hophornbeam (*Ostrya virginiana*), white ash (*Fraxinus americana*), slippery elm (*Ulmus rubra*), and American elm (*U. americana*). The commonest shrub associates in this area are hawthorn (*Crataegus* spp.), common prickly-ash (*Zanthoxylum americanum*), and Arkansas rose (*Rosa arkansana*). Woody vines include wild grape (*Vitis vulpina*), poison ivy (*Toxicodendron radicans*), greenbrier (*Smilax hispida*), and Virginia creeper (*Parthenocissus quinquefolia*).

LIFE HISTORY

Seeding Habits

Flowering and Fruiting

The flowers of black maple appear when the leaves are about one-third grown. May is the average month for flowering in Indiana and southern Michigan, while sugar maple starts in April and continues into May (5). In southwestern Illinois and western Missouri, the black and sugar maples flower at the same time (2, 10).

Black maple bears both perfect and unisexual flowers, normally on separate trees. However, staminate and pistillate flowers may be found in the same cluster or in separate clusters on the same tree. Maples are primarily bee-pollinated; consequently cold, damp weather during flowering reduces insect activity and pollination (19). Frost damage is infrequent, due to the lateness of flowering.

The fruit is composed of 2 samaras united at the base, each with a wing ½ to 1 inch long; the wings are set wide apart. The reddish-brown seed is ¼ inch long. The fruit ripens in September or October depending on the latitude. Cleaned seeds from one locality averaged about 4,200 per pound and about 50 percent in soundness (17).

Seedling Development

A study of reproduction in central Iowa (1) indicated that black maple reproduces freely from seed where conditions are favorable. Advance reproduction numbered 16,250 per acre under a maple-basswood stand on a north slope. Black maple constituted 65 percent of the overstory. On a south slope where black maple made up 25 percent of the trees in an oak-hickory stand, there were 3,400 seedlings per acre. On a flood plain the number of maple seedlings dropped to 300 per acre.

Sapling Stage to Maturity

Black maple commonly attains a height of 80 feet and trunk diameters of 2 to 3 feet. Round-topped, oval, or pear-shaped crowns are typical of trees growing in open locations. Black maple crowns tend to be denser and have a richer green foliage than those of sugar maple. The leaf differs by being less dissected in outline, usually 3-lobed, pubescent on the lower surface in varying degree, and having a drooping habit (fig. 3 on next page). Conspicuous leaf-like stipules are often present at the base of the leaf stem (7, 14).

The severe drought of 1934 in central Iowa resulted in heavy mortality of black maple in a maple-basswood association (1). Basswood associated with the maple was not killed.

SPECIAL FEATURES

Commercially there is no distinction made between black maple and sugar maple wood, both being classed as hard maple in the lumber trade. For all practical purposes the woods are identical (4). Black maple sap, like that of sugar maple, is used in the production of maple syrup and sugar.

Figure 3.--A typical leaf of black maple. Leaf shape represents the most distinct difference between black maple and sugar maple. (Photo courtesy Norman Smith, Michigan Conservation Department.)

RACES AND HYBRIDS

Black and sugar maples cross freely wherever they grow together, but the hybrid forms do not obscure the parental ones (6). Desmarais has demonstrated that there is a long geographical gradient of introgression between the two, the intermediates resembling whichever parent is most abundant at the particular location where the hybridization occurs (6).

LITERATURE CITED

1. Aikman, J. M., and Smelser, A. W.
   1938. The structure and environment of forest communities in central Iowa. Ecol. 19: 141-150.

2. Anderson, E., and Hubricht, Leslie.
   1938. The American sugar maple. I. Phytogenetic relationships as deduced from a study of leaf variation. Bot. Gaz. 100: 312-323, illus.

3. Bowman, Isaiah.
   1911. Forest physiography. 759 pp., illus. New York.

4. Brown, H. P., and Panshin, A. J.
   1940. Commercial timbers of the United States. 554 pp., illus. New York.

5. Deam, Charles C.
   1940. Flora of Indiana. Ind. Dept. Conserv., Div. Forestry, 1236 pp., illus. Indianapolis.

6. Desmarais, Yves.
   1952. Dynamics of leaf variation in the sugar maples. Brittonia 7(5): 347-387, illus.

7. Harlow, William M., and Harrar, Elwood S.
   1941. Textbook of dendrology covering the important forest trees of the United States and Canada. Ed. 2, 542 pp., illus. New York.

8. Kucera, Clair L.
   1952. An ecological study of hardwood forest area in central Iowa. Ecol. Monog. 22: 283-297, illus.

9. Little, Elbert L., Jr.
   1953. Check list of native and naturalized trees of the United States (including Alaska). U. S. Dept. Agr. Handb. 41, 472 pp.

10. Mackenzie, Kenneth.
    1902. Manual of flora of Jackson County, Missouri. 242 pp., illus. Kansas City.

11. Marbut, C. F.
    1935. Soils of the United States. In Atlas of Amer. Agr., Part III, U. S. Dept. Agr., 98 pp., illus.

12. Millar, C. E., and Turk, Lloyd M.
1943. Fundamentals of soil science. 462 pp., illus. New York.

13. Over, William H.
1932. Flora of South Dakota. Univ. S. Dak., 161 pp., illus. Vermillion, S. Dak.

14. Sargent, Charles S.
1933. Manual of trees of North America (exclusive of Mexico). Ed. 2, 910 pp., illus. Boston.

15. Shanks, Royal E.
1953. Forest composition and species association in the beech-maple forest region of western Ohio. Ecol. 34: 459.

16. Society of American Foresters.
1954. Forest cover types of North America (exclusive of Mexico). Rpt. of Com. on Forest Types, 67 pp., illus. Washington, D. C.

17. Swingle, Charles F.
1939. Seed propagation of trees, shrubs, and forbs for conservation planting. U. S. Soil Conserv. Serv., SCS-TP-27, 198 pp. (Processed.)

18. U. S. Department of Agriculture.
1941. Climate and man. U. S. Dept. Agr. Yearbook, 1248 pp., illus.

19. Wright, Jonathan W.
1953. Notes on flowering and fruiting of northeastern trees. U. S. Forest Serv., Northeast. Forest Expt. Sta., Sta. Paper 60, 38 pp., illus. (Processed.)

SILVICAL REPORTS PUBLISHED OR IN PREPARATION

This is the fourteenth of the silvical reports being prepared by the Lake States Forest Experiment Station. Already published are:

Station Paper 44 - Red pine
Station Paper 45 - Black spruce
Station Paper 47 - Rock elm
Station Paper 49 - Quaking aspen
Station Paper 50 - Sugar maple
Station Paper 52 - Tamarack
Station Paper 54 - American elm
Station Paper 55 - White spruce
Station Paper 59 - Slippery elm
Station Paper 61 - Jack pine
Station Paper 62 - American basswood
Station Paper 63 - Bigtooth aspen
Station Paper 65 - Balsam poplar

Soon to be published is the last of the silvical reports prepared by this Station--northern white-cedar.

SOME RECENT STATION PAPERS

Chemical Control of Brush and Trees in the Lake States.
Paul O. Rudolf and Richard F. Watt.
Station Paper 41, 58 pp., illus. 1956.

Wood Pallets in the Minneapolis-St. Paul Area: An Outlet for Low-Grade Hardwoods.
John R. Warner and D. R. Cowan.
Station Paper 43, 34 pp., illus. 1956.

The Market for Domestic Charcoal in Wisconsin.
John R. Warner and William B. Lord.
Station Paper 46, 15 pp., illus. 1957.

Natural Regeneration on a 2-Acre Mixed-Oak Clear Cutting Five Years After Logging.
Harold F. Scholz and A. J. DeVriend.
Station Paper 48, 11 pp., illus. 1957.

Deterioration of Sugar Maple Following Logging Damage.
Gene A. Hesterberg.
Station Paper 51, 58 pp., illus. 1957.

A Record of the Timber Cut from Forests of the Lake States, 1954.
Arthur G. Horn.
Station Paper 53, 47 pp., illus. 1957.

Marking Guides for Northern Hardwoods Under the Selection System.
Carl Arbogast, Jr.
Station Paper 56, 20 pp., illus. 1957.

Managing Red Pine for Poles in Lower Michigan.
Paul C. Guilkey.
Station Paper 57, 21 pp., illus. 1958.

Proceedings, Third Lake States Forest Tree Improvement Conference, Sept. 17, 18, 1957.
Lake States Forest Experiment Station.
Station Paper 58, 87 pp., illus. 1958.

The Forest Insect and Disease Situation, Lake States, 1957.
Donald C. Schmiege and R. L. Anderson.
Station Paper 60, 22 pp., illus. 1958.